



Project Description

May 16, 2012

Biomethanization

Including a preparation pit, a KomBio Reactor LIPP – Vol. 1200m³ (317 000 gal.) used with slurry and food scrap, CHP 2 X 94.5 kW, a liquid/solid separator and a building.

Presented to Riverview Farm





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INTRODUCTION

This budgetary proposal is for the engineering, procurement, fabrication and start-up of an anaerobic digestion system by Bio-Methatech Inc. Established in 2006, Bio-Methatech is a renewable energy company that designs, builds and commissions the LIPP GmbH KomBio Reactor, Hydrolysis units and other components needed for an integrated biogas project. We are proud to offer these world class biogas systems developed by LIPP GmbH which are designed and manufactured in Canada to North American customers' specifications. Over the years Bio-Methatech has gained considerable North American experience in areas such as project feasibility analysis, conceptualization / planning, engineering / design, and installation / commissioning. Our expertise, combined with the considerable experience of the LIPP technology which is deployed around the world (700 plus systems installed in Germany, Holland, Switzerland, China, Japan, Australia, Peru, Italy and Canada) has allowed us to earn the trust of many valued customers to-date.

1. Quality Assurance & Security

Quality Assurance is an important part of Bio-Methatech's management and manufacturing philosophy. For each country, state and/or province we respect the environmental standards, the electrical requirements and the security codes. Bio-Methatech holds, designs and builds to the following manufacturing certifications: For Canada, we respect Canadian Standards Association Code (CSA) and for the USA we respect American Standard Code (UL standards). Our drawings are examined and approved by local engineers.

As a footnote, the LIPP digesters conform to the German regulations which are very severe. Lipp has met the most demanding quality and safety conditions when building containers and tanks for storing solid, liquid and gaseous substances for 50 years.

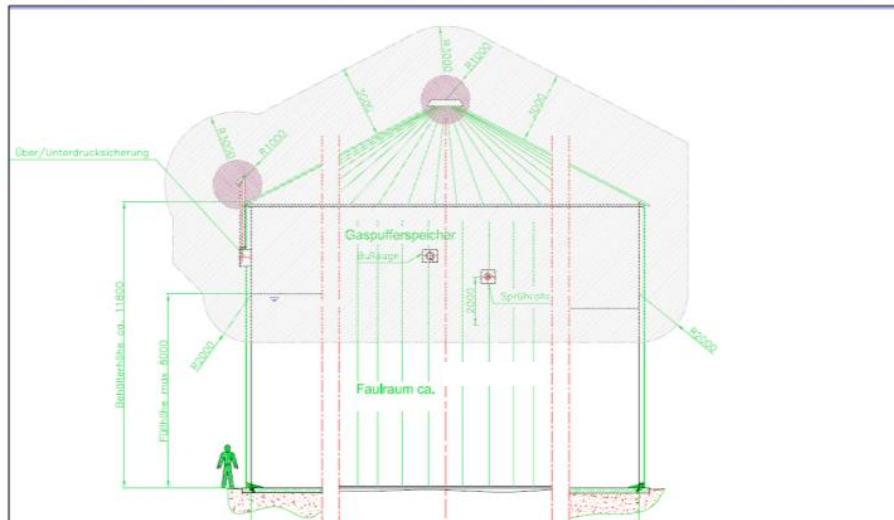
The security of our systems is a priority during the construction, equipment operation and as it relates to the environment. The LIPP digesters have many security characteristics in regard to biogas. Firstly, the integrated biogas reservoir for storage is protected by a steel roof to avoid any injury from outside elements (wind, snow, rain...). Furthermore, the biogas reservoir is completely airtight and is maintained at ambient pressure to avoid any risk of explosion. In case of excessive biogas production, a special mechanical exhaust outlet allows the biogas to escape into the atmosphere to avoid overpressure in the integrated biogas reservoir.



Overpressure Biogas Exhaust



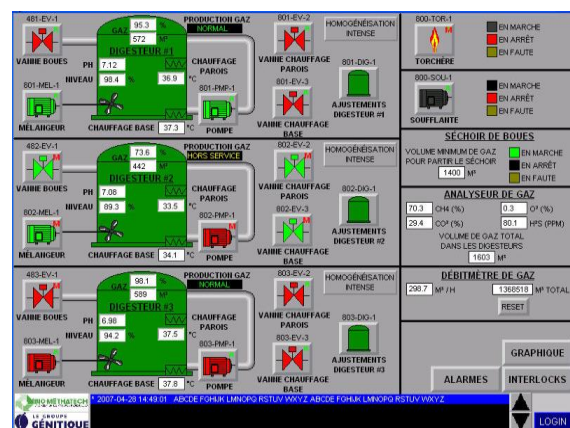
Even though the biogas reservoir is maintained at a low pressure level, the following security codes are still respected: no electric equipment in zone 1 (pink) and only explosion proof equipment in zone 2 (grey), see figure below:



Security zones for the LIPP KomBio reactor to protect the integrated biogas reserve.

The control screen is equipped with special alarms including biogas volume monitoring in the biogas reservoir, protection alarms for avoiding over heating of the agitation equipment motors and in the digester, a CH₄ alarm, and a low and high pH alarm.

At the discretion of the customer, these alarms could be connected by phone or via computer.



Screen Control for The LIPP Digesters



2. Facilities, Services & Local Supply

Bio-Methatech's administration offices are located in Vieux-Montreal, St-Paul Street West (Quebec), and our Dominion & Grimm manufacturing facilities (Dominion & Grimm being the principle owner) are located in Ville d'Anjou, Montreal. Our 85 000 pi² factory is specialized in stainless steel works for over 60 years, an important competency to build the LIPP digesters given the stainless steel materials they employ. Over the years, Dominion & Grimm has developed a great expertise with burners, boilers, pumps, piping, electric panels, reverse osmosis equipment and after sales service.

The Dominion & Grimm Aftersales Service Team is devoted to the highest level of customer satisfaction. The Service Team has been providing a comprehensive level of support to over 6500 D&G customers in Quebec, Ontario, New-Brunswick and North-East USA for over 50 years

One important example of what our service team provides is the close monitoring of the methanization / digestion process. Important and standard readings such as feed rate, mixing schedule, pH control and biogas production, are monitored periodically on site and remotely via internet for one year which allows the team to stay on top of the anaerobic digester system performance on behalf of the customer.

With respect to supporting the local economy in regards to labour, materials and system components, Bio-Methatech is aware and appreciates the importance of employing these resources in and around the project site. This is why Bio-Methatech sources and purchases the majority of the project components from local suppliers as one of many "Best Practices" we employ.

Normally, greater than 60% of the components, equipment and labour are selected in the vicinity of the project site. Some examples of these resources hired locally are concrete works (foundations, cement pre-pits, etc.), digester insulation, digester exterior cladding and roofing, electrical and piping works and excavation.

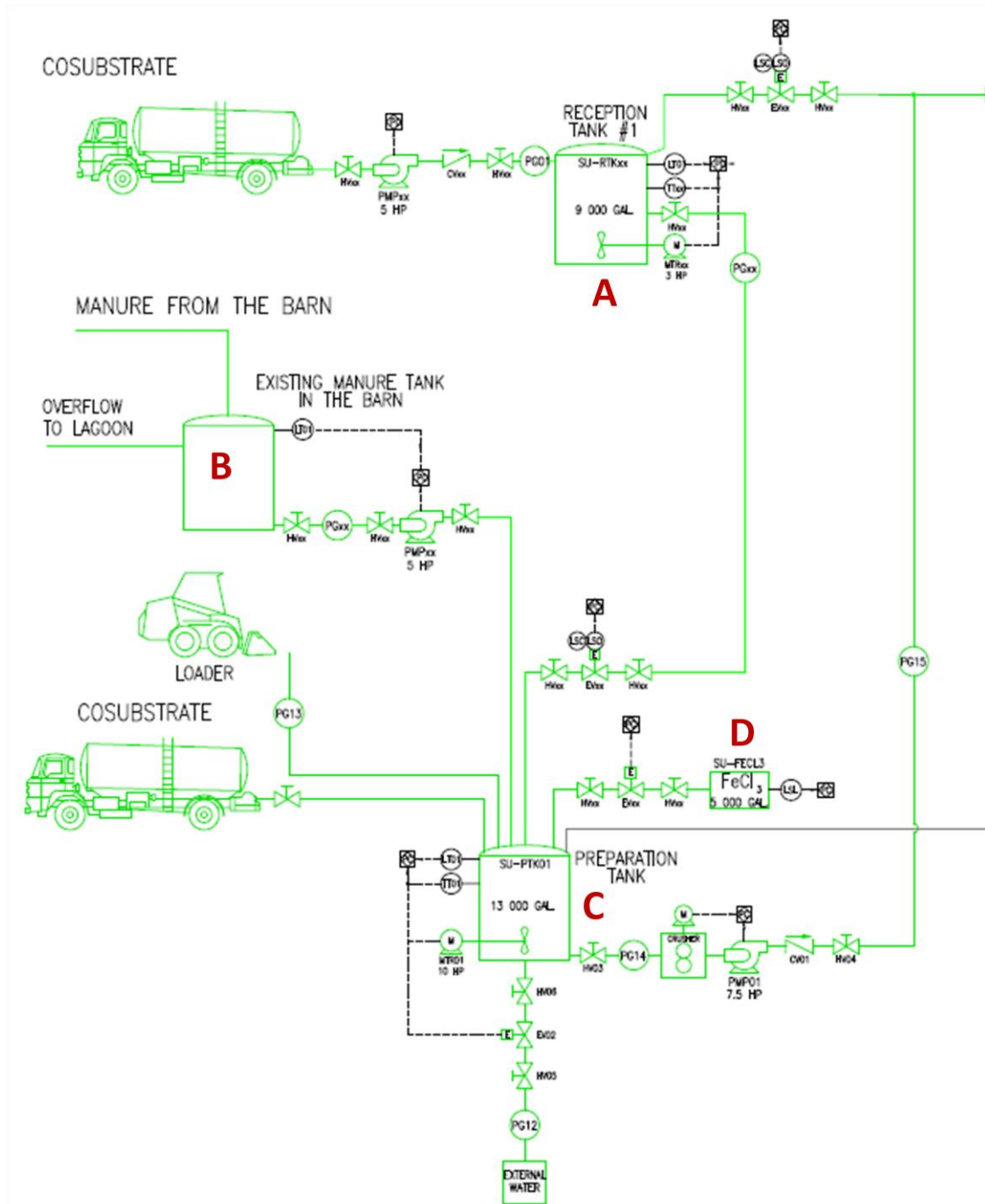
3. Project description

The major goal of the project is to produce enough biogas to generate 190kWh of electricity. With a CHP (combined heat and power) it will be possible to recover the heat produced from the engine and use it for the process and for the farm building.

To reach this goal, Bio-Methatech has previous a flexible set up. Then, the Riverview Farm will have all the latitude to manage a large range of substrate kinds. The reception area is beside a new building specially designed for pumpable substrates (slurry, SSO, fogs) or non pumpable substrates like silage, corn, hay.

The digestion process will receive the slurry 7 days on 7, and some other co substrates when it is necessary. The digester will be fed from the preparation tank. At the exit of the digester, the digested matter will be treated in a solid/liquid separator. The liquid will be stored in the existent lagoon before to be use in the field as a fertilizer. The solid will be stored on a concrete floor inside the new building and will be use later like animal bedding or like fertilizer.

The reception area is designed to be fed with a variety of substrates and co substrates. The reception area could receive annually around 5 800 000gal (22 000m³) of wet matter (between 5% to 15% DM).



5



This tank is use as a co substrate temporary storage like a buffer tank to stabilise the biogas production close to the goal electricity production. The material will be pumped directly toward the preparation tank (C).

B- Buffer tank: This tank is located directly at the slurry exit in the barn, just before the lagoon. From this buffer tank the slurry will be pumped to preparation tank (C). In the case of any problem with the digester process, an overflow will be installed and the slurry will be deviated directly to the lagoon to avoid any slurry accumulation in the barn.

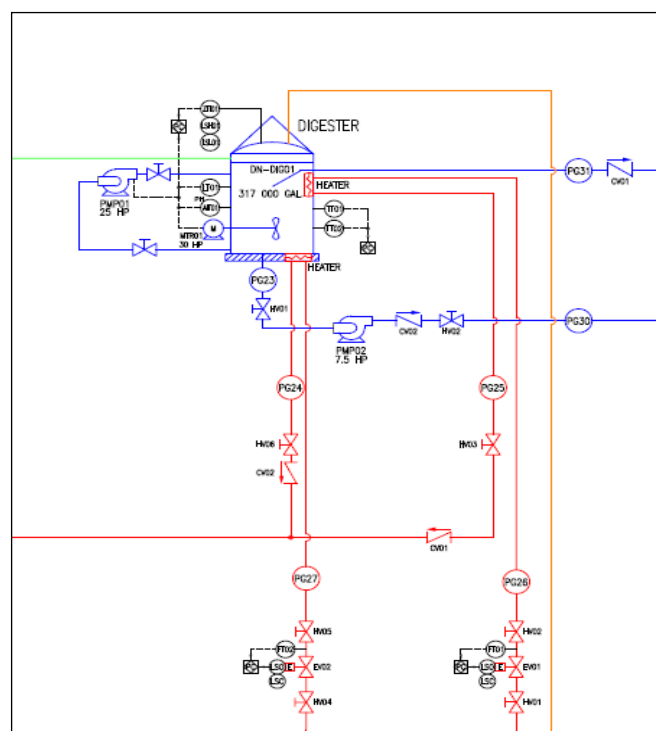
C- Preparation tank: localised underground beside the new building, this concrete pit have a volume of 13 000gal. This pit will receive material come from tanks A and B. Furthermore, the preparation tank have on its top a trap to receive dry organic material (without wood, metal, plastics, glass, sand and any non organic material). A grinder will crush and mix the matter to become pumpable. The liquid part of the digestate could be reintroduced at this step to reach the ideal texture and humidity level.

D- FeCl_2 storage tank and dosing: ferric salts will be introduced in the preparation tank (C) to control the H_2S level in the biogas.

Bio-Methatech includes in the reception area any components needed to its good running, like pumps, valves, grinder, pipes, electrical connections and automation as illustrated in the P&ID.

5. Digestion process

The digestion process occurs in the digester vol. 317 000gal. The digester is a tank made of Verinox LIPP material as a cylinder on a heated concrete base.





LIPP KomBio Reactor Vol. 1 200m³

LIPP KomBio Reactor 1 200m³	
Fermentation volume	317 000gal
Tank Diameter	15m (45.9ft)
Cylindrical Tank Height	10.6m (37.4 ft)
Filling Height	6.8m (25.6 ft)
Integrated Biogas Storage	350 m³ (92 500gal)
Operating Temperature	35 – 42 °C (mesophilic range)

LIPP KomBio Reactor is made of 'Verinox' stainless steel with the complete integrated gas storage tank (modular system), consisting of the following components and accessories. The operating temperature of the system is in the mesophilic range: 35 – 42 °C.

LIPP digester overview

1. Gas storage
2. Verinox
3. Digester
4. Wall heating
5. Insulation



KomBio reactor accessories:

- 1 LIPP container as biogas reactor made from stainless steel 'Verinox', lining material 1.4571
- 1 Integrated gas accumulator cover special quality S 80 B/G, from flexible, coated polyester fabric, resistant to gas and slurry, as unpressurized buffer storage tank
- 1 Insulation for container wall with 200 mm aluminium-lined mineral wool
- 1 Wall heating; the heating pipe is coiled around the outer wall of the container; for circulating hot water; to be connected to the heating manifold of the CHP plant.
- 1 Cladding for container cylinder, from galvanized steel corrugated sheet, painted in the RAL colour



- 1 Roof as segmented roof from galvanized steel with 28° roof inclination, external paint in the RAL colour with suspended fabric film (inside) for additional roof insulation
- 1 Filling connections DN 150 from stainless steel
- 1 Outlet DN 250 from stainless steel
- 1 Emptying connection DN 150 from stainless steel with 2 gate valves 8"
- 1 Manway (manhole) opening DN 800 with stainless steel cover
- 1 Mechanical pressure protection device
- 1 Hydraulic pressure protection device
- 1 Gas extraction connector DN 150
- Homogenization system designed as a mechanical system with flow guide tube and electric motor (18 – 22.0 kW) as a drive system, and a facility for optional drive using a tractor PTO, as well as a
- Homogenization system by means of a pump (18.5 kW), for the activation of the fermentation process, called the LIPP multi-pump system
- 1 Ladder with 2 platforms, made entirely from galvanized steel.
- 1 Gas level indicator, mechanical, installed on the outside of the container
- 2 Connections for desulphurization, from stainless steel 1.4571
- 2 Connections for temperature measurement, from stainless steel 1.4571
- 1 Spray nozzle for pumping system as well as 1 connector with gate valve and blind flange
- 1 Control opening in container wall for the water sealing ring of the gas cover
- 1 Porthole with viewing glass cleaning system (sight glass fitting)
- Verifiable structural calculations and foundation diagram

Including the assembly from the foundation surface according to our conditions; including the sealing works between the steel tank and the foundation plate and the proofable static equilibrium and foundation plan.

Heating system and insulation

Hydolyzer LIPP is provided with a pipes network fed with heated glycol water. The pipes are fixed on surface external of the metal wall to avoid the direct contact with the substrate. A layer of insulating wool of 20cm covers this pipes network to maintain internal heat around approximately 99°F. A vapour-barrier precedes sheet steel and complete the coating.



Mixing

A SUMA propeller mixer (20HP) is installed on a concrete plate out of the tank. The propeller is placed inside the tank with an angle supporting the formation of a gyratory current which at the same time makes it possible to mix the substrate well and to support the deposit of the sediments in the center of the tank in the basic drain. Function only between 10 and 20 minutes per hour.





Basin drain

The bottom of the hydrolyzer, in the central part, have a drain makes it possible to easily evacuate the sediments without having to stop the process. This procedure is carried out systematically, from 1 to 4 times per month, according to the rate of sedimentation.



The multi pump

Moreover, a multipompe (30HP) provided with a double connection controlled by electric valves makes it possible to collect the floating substrates, such as fats, to inject them in the bottom of the digester in order to obtain an effective rate of digestion by avoiding the formation of crust on the surface. Function only 5 to 10 minutes per hour. Thus, in alternation, the multi pump takes the heavy sediments to inject them at the top of the digester, and the light matters to inject them at the bottom of the digester. The material floating on the surface can also be evacuated from the digester if plastics would have been introduced into the process.



Integrated gas storage

LIPP Kombio digester comprises in its higher part, a reserve which makes it possible to store a volume of biogas for a short run. This reserve is made of a membrane gases tight which is attached to the digester by a fixed metal hoop submerged in a gutter filled with glycol. The glycol gutter is tight with a pressure of 0.1Bar and a vent of safety is placed on the gutter in order to maintain a pressure of only 0.01Bar. In this way, when the biogas reserve is full, the surpluses are evacuated by the vent of safety at once that the pressure reached 0.01Bar.

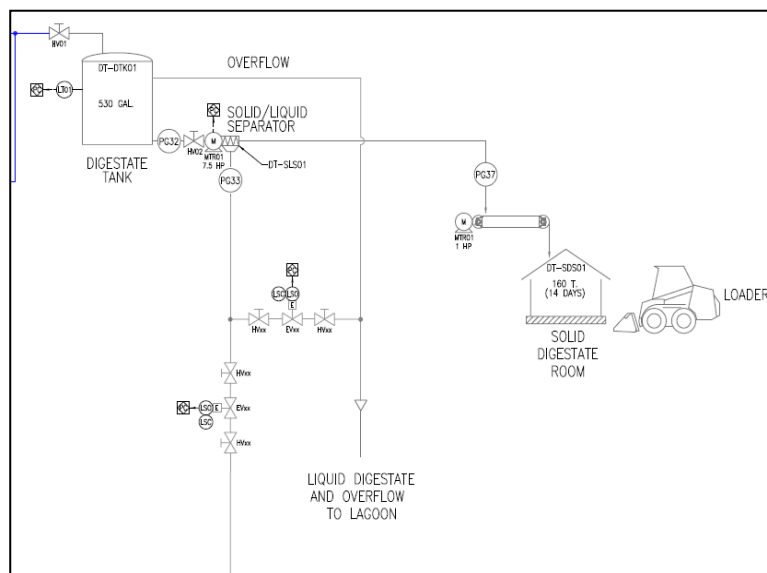




Bio-Methatech includes in the digestion process any components needed to its good running, like concrete basements, pumps, valves, pipes, electrical connections and automation as illustrated in the P&ID.

6. Digestate management

After the digestion process, the digested matter is called DIGESTATE. At the exit of the digester, the digestate will move by gravity to a solid/liquid separator. The solid part will be stored for a short time on concrete floor inside the new building (30 ft X 30ft area). The liquid will be moved by gravity to the existing lagoon.



Solid/liquid FAN separator

The liquid/solid separator selected is the PSS-3.2-520 FAN model (press screw separator). This equipment has been selected for his high performance, low cost maintenance and high reliability. The screw press will be preceded by a small buffer tank of 50gal. The solid part will be move on a conveyor to the floor (dry digestate area).

FAN PSS; 220gal/minute

Model	2.3-520
Capacity	220US gpm
Parallel shaft helical geared motor	5,5kW

The liquid part could be used as water process in the preparation tank at the head of the process when it's required.



Press Screw Separator FAN.



7. Biogas, electricity and heat management

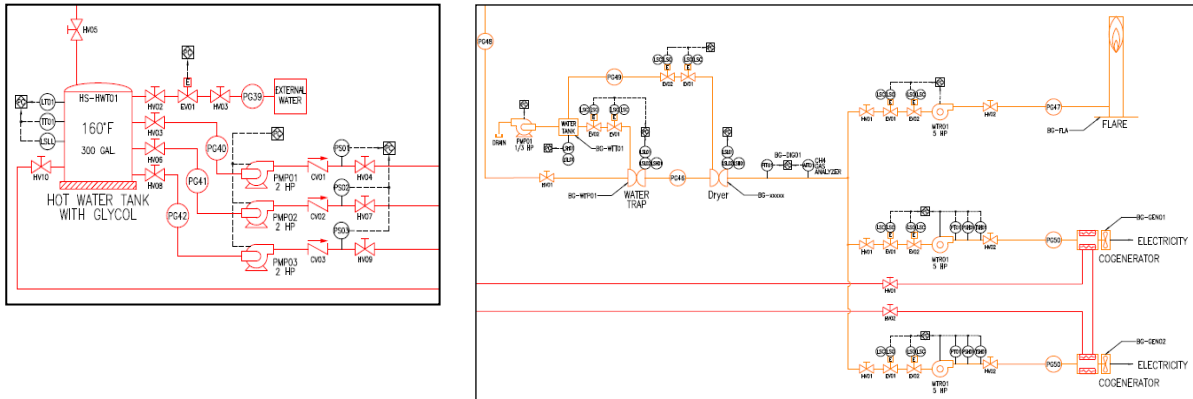
CHP

To use the biogas, two CHP (model 2G-KWK-94.5BG BIO-TEC) will be installed inside the new building. The CHP will have the optional sound attenuated enclosure (less than 65 dB at 33 feet). The electrical efficiency is 34.4% and the thermal efficiency 49.2%. See the table below:

Engine Type:	OTTO – Gas 4 Stroke
Engine Core:	MAN® Biogas Engine E0836 LE202 2G® Biogas Optimized
Arrangement:	IL
Cylinders:	6
Displacement:	419 cubic inch
Speed:	1800 rpm
Bore:	128 mm
Stroke:	166 mm
Compression Ratio:	11:1
Max Engine Power:	147 BHP
Continuous Electrical Output:	94.5 ekW (electrical)
Total available Heat Recovery / Continuous Thermal Output (<i>Jacket Water Heat & Exhaust Heat combined</i>):	143 kW (thermal)
Total available Thermal Output (<i>Jacket Water Heat & Exhaust Heat Recovery combined</i>):	487,936 BTU/h
Total combined CHP System Energy Output (<i>Electrical & Thermal</i>):	242.75 ekW
Water Temperature Out:	90°C / 194°F
Ø Return Water Temperature:	70°C / 158°F
Ø Thermal Heat Water Flow LT:	7,881 Liter/h 2,082 Gal/h
Exhaust Gas Temperature cooled to:	180°C / 356°F
Exhaust Gas Mass Flow (wet):	530 kg/h 1,168 lbs/h
Exhaust Gas Flow Volume:	717 m³/h 25,320 ft³/h
Electrical Efficiency:	34.40 %
Thermal Efficiency:	49.20 %
Combined CHP Efficiency:	83.60 %
Configuration:	Biogas
Gas Consumption:	1,740 ft³/h 29.00 cfm @ x 55 - 60% CH ₄
Engine Oil Consumption:	0.2 g/kWh
First Major Engine Overhaul after:	60,000 Hours



The CHP provides electricity and a high heat temperature used to heat the hot water tank with glycol and the digester process. The heat over production could be used to heat the farm buildings.



Flare

A closed flare will be installed to burn the over biogas production. The flare meets International US Burning Requirements, CSA and UL.

Bio-Methatech includes in the biogas, electricity and heat management process any components needed to its good running, like concrete basements, pumps, gas blowers, valves, pipes, electrical connections and automation as illustrated in the P&ID.



To be installed at a remote Location (stand-alone)

- Capacity: max 150m³/h (5297 ft³/h)
- Gas Flow Pressure Range: 50 – 80 mbar (0.72 – 1.16 psi)
- Heat Value: 5.5 kW/m³
- Burning Capacity: up to 825kW
- Exhaust Temp: approx. 850 deg C (1562 deg F)
- Gas Pipe Connection Flange: DN65
- Height: approx. 4500mm (14.7')
- Flame Pipe Diameter: approx. 500mm (1.64')
- Flame Pipe Length: approx. 1000mm (3.28')
- Incl. Support Frame
- All in Stainless Steel
- Including Control System

- Controlled Combustion Environment
- Increased Destruction Efficiency
- Natural Draft Design
- Low Operating Costs
- No Visible Flame
- No Visible Emissions
- Smokeless Operation
- Low Noise
- 8 to 1 Turndown Ratio
- Meets U.S. and international Requirements
- CSA / UL
- Fully Automated Controls
- Reduced Personnel Requirements

EMISSIONS:

- Destruction Efficiency 99.5%
- Low NOX Emissions
- < 0.06 lb/MMbtu (0.11 kg/MMkcal)
- Low CO Emissions
- < 0.11 lb/MMbtu (0.2 kg/MMkcal)

8. Start up and follow up

The start up includes the site supervision, process data follow up on computer (by internet) for one year, one paper version operation book and one electronic version, a staff formation (20 hours) and one year of feedstock professional advices.



9. Scope of work for Bio-Methatech and subcontractors

9.1 Bio-Methatech scope of work

Bio-Methatech is a Canadian company from Quebec. In this project Bio-Methatech will act as the general contractor providing a turnkey project. All the site work and some of the engineering services will be sub-contracted to Vermont companies. Over 70% of the material and services for this project will be bought in USA.

The Bio-Methatech project manager and his automation technician from Canada will have to be onsite most of the time to manage sub-contractors and to do the commissioning, the start-up and the training on the system.

The Bio-Methatech biologist from Canada will have to be onsite to manage the start-up feeding recipe of the digester.

9.2 Dominion & Grimm Environnement scope of work

Dominion & Grimm Environnement is a Canadian Company from Quebec partner with Bio-Methatech. Dominion & Grimm Environnement will provide most of the biogas production specialised equipments:

- Lipp Digester Tank
- SSO tank
- Heating system with pumps and valves
- Control panels

Dominion & Grimm will sub-contact a part of the tanks installation to Dominion & Grimm USA and the building sub-contractor (see section 9.3 and 9.8)

One worker from Lipp in Germany will have to be onsite to supervise the construction of the Lipp tanks because this type of construction needs a specialised supervisor.

Two or three workers from Dominion & Grimm in Canada will have to be onsite to operate a special machine used to build the Lipp tanks.

9.3 Dominion & Grimm USA scope of work

Dominion & Grimm USA is an American company from Vermont. In this project Dominion and Grimm USA will provide workers from USA to build the Lipp tanks and to do construction supervision and commissioning with Bio-Methatech project manager.

9.4 Cross Consulting Engineers scope of work

Cross Consulting Engineers is an American engineering company from Vermont. In this project Cross Consulting Engineers will provide all the structure and civil engineering work and the construction supervision for the structure work.



9.5 Le Groupe Genitique scope of work

Le Groupe Genitique is a Canadian engineering company from Quebec. In this project Le Groupe Genitique will provide all the process engineering work.

9.6 Pearson and Associates scope of work

Pearson and Associates is an American engineering company from Vermont. In this project Pearson and Associates will provide all the electrical and mechanical engineering work and the construction supervision for the electrical and mechanical work. Pearson and Associates will approve the process engineering of Le Groupe Genitique and the construction supervision for the process work.

9.7 Civil site work contractor

The civil site work contractor is not selected yet, it will be an American company from Vermont. This contractor will do all the civil site work for the project. We should invite the following contractors to bid:

- J. Hutchins, Inc. ,88 Rogers Lane, Richmond
- EE Parkard Enterprises, RR2, East Montpelier
- Dirt Tech Company, LLC, 118 VT Route 117, Jericho
- Munson Earth Moving Corp.,85 Shunpike Road, Williston
- Engineers Construction Inc.,98 Engineers Drive, Williston
- Wright Excavating Inc., County Rd , Franklin

9.8 Building site work contractor

The building site work contractor is not selected yet, it will be an American company from Vermont. This contractor will do all the structure site work for the project. We should invite the following contractors to bid:

- AV Construction, 1103 Davis Road, Enosburgfalls
- Connor Contracting, 278 S. Main St. St. Albans and Montpelier
- Gosselin Construction, 56 Congress St. St. Albans



9.9 Concrete site work contractor

The concrete site work contractor is not selected yet, it will be an American company from Vermont. This contractor will do all the concrete site work for the project. We should invite the following contractors to bid:

- SD Ireland, 193 industrial avenue, Williston
- Harrison Concrete, 1803 Skunk Hill Road , Fairfax

9.10 Electrical site work contractor

The electrical site work contractor is not selected yet, it will be an American company from Vermont. This contractor will do all the concrete site work for the project. We should invite the following contractors to bid:

- Lamberton Electric, 91 Granite Shed Lane, Montpelier
- Mike's Electric, Inc., 1045 Route 242, Jay
- Omega Electric, 31 Commerce Ave., So. Burlington
- CIR Electrical services, 1959 Sheldon Road, St.Albans

9.11 Mechanical site work contractor

The mechanical site work contractor is not selected yet, it will be an American company from Vermont. This contractor will do all the concrete site work for the project. We should invite the following contractors to bid:

- New England Air Systems, 43 Krupp Drive, P.O. Box 525, Williston
- VHV, 16 Tigan Street, Suite A, Winooski
- Mountain Air Systems, Inc., 75 Ethan Allen Dr # 301, South Burlington
- ARC Mechanical Contractors Inc. , 229 Depot Street, Bradford